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EDITORIAL NOTES

THE SOUTHERN MEET AGAIN

LAST Friday's meeting in London of the Southern Association was generally voted a very considerable success. Even in these stressful times, members alike who walked across the road from Gas Industry House and those who undertook the arduous journey from the far away South-West will have accounted their time well spent. Apart from some first-class "business," the whole foregathering was excellent for the morale. We have too few opportunities these days of meeting our colleagues; too many opportunities of contemplating our own worries without hearing about theirs. The Association had the chance at last of expressing its appreciation of Mr. F. Blackburn's Presidency. He took office in 1939, and, as those who knew him would expect, even Hitler's worst failed to blast him out of it until a successor was ready to take on. Another "war-horse" in the person of Mr. G. le B. Diamond succeeds him, and not the least interesting part of his admirably framed Address was a brief account of life on the south-east coast in the summer and autumn of 1940. It was good to see Mr. W. A. Howie once more exercising his Secretarial authority, and under his experienced guidance and management everything went with a swing. If the Paper Controller would permit, we could in fact produce an issue of the "JOURNAL" reminiscent of the piping times of peace; even luncheon speeches seemed to have a freshness about them which was often so sadly lacking in the old days. But we must not complain; even the "Technical Press" came in for its share of praise at the meeting, and like others in many lines of business who have not nearly as much straw as they would like for their brick-making, we are highly appreciative of appreciation and encouragement.

A CALL FOR UNITY

THE centrepiece of the meeting was Dr. E. W. Smith's informal Address—his first public appearance, we believe, since his appointment as Director-General, though we notice he is shortly to talk also at a Midland Association Meeting. Whether intentionally or not, these two events are highly symptomatic of what we imagine to be one of Dr. Smith's leading themes in connexion with his ideas on reconstruction. He will not have it on any account that the Directorate either can or wishes to reconstruct the Industry. This, he quite rightly maintains, can only be done from within. But "within" does not mean leaving the whole matter in the hands of the B.G.F. or any other Committee. It means that the whole Industry must pull all its weight, and that the Committee must be given all the help for which it is asking *from the districts*. The re-shaping process will in any case involve a long pull and a strong pull, but if we all pull together Dr. Smith has not the least doubt we shall emerge from the present crisis fitter and readier than ever before to cope with a future which he depicts in very roseate colours. His assurances on the present state of Gas Industry prestige are extremely heartening. He moves in many circles, both official and industrial, and he never was a flatterer. Most certainly we must not relax for one second, but it is comforting to know that we are not putting up too bad a show—contrary, perhaps, to the forbodements which assail us from time to time as one difficulty after another arises and demands solution.

Equally heartening is the fact that the Director-General has satisfied himself that the Industry's Post-War Planning Committee is making progress—and upon right lines. For reasons which we mentioned a week or two ago, working reports cannot at present be expected from the Committee, but Dr. Smith's Directorate, as we then recorded, is in close contact with them, and is entirely happy about the situation. Apart from the fact that an independent view of this kind is most encouraging at this juncture, it would be disastrous if diverging views on reconstruction were held respectively by the Directorate and the Industry as represented by its P.W.P. Committee. It is for the Industry, through this Committee, to decide upon the measures required for its own reformation, and Dr. Smith, expressing himself personally fully satisfied with its leadership and its personnel, appealed to the Industry for wholehearted loyalty behind it. With earnest discussion in all the districts, among seniors and juniors, in adminstrative, engineering, and commercial spheres alike, there will, he maintains, eventually be such an accumulation of wisdom that Headquarters will have little difficulty in defining the Industry's problems with a precision which will enormously simplify their solution. But nobody believes that any solution is likely to be found which can be implemented without powers that the Industry does not yet possess, and this is where the Directorate, knowledgeable and sympathetic already, and becoming even more so by the closest possible association with the P.W.P. Committee, should be able to be of the greatest assistance. It is, in fact, precisely the link with the outside official world which the Gas Industry has, to its grave disadvantage as compared with others, always lacked.

Such, then, was Dr. Smith's appeal to the Industry for unity behind the Committee and unanimity in reaching conclusions; for the putting aside of old prejudices and for one hundred per cent. loyalty to the existing leadership; for a supreme effort on every side to give positive assistance in the formidable task which is in hand. His appeal will undoubtedly receive the consideration which it merits, not only in the light of Dr. Smith's present position, but of the progressive views which he often freely expressed before his appointment as Director-General.

COAL AND FUEL RATIONING

LAST week's debate in the House concerning the coal situation was not such as to give rise to optimism. We have emerged from this winter—the third severe winter in succession since the war began—without hardship and without any undertaking essential to the prosecution of the war being stopped for want of coal or power, but the Secretary for Mines stated quite bluntly that it would be a very difficult task to meet next year's demand, that it was certain that next winter's consumption would be heavier than it had been this winter, and that it was not enough to rely on greater output. The basic trouble is, of course, production. Since the beginning of the war about 70,000 miners have been drawn off into the Forces and into other industries. Increased man power in the mines would seem, therefore, an urgent need. The disquieting features of absenteeism and reduced output per man were emphasized during the gloomy debate. The President of the Board of Trade was more trenchant than the Secretary for Mines. He said we had just scraped through so far with luck, but we could not count on the recurrence of that luck. Production must be increased; consumption must be diminished. Pointing to the ineffectiveness

of exhortations to economize, he stated that the Government had decided that a comprehensive scheme of fuel rationing should be introduced as soon as possible. Sir William Beveridge was at work devising the most equitable methods of restricting consumption of fuel and power, but the Government did not intend to await his report before taking immediate action to cut down fuel consumption. He promised that an Order would be made to restrict domestic consumption.

From the start the Gas Industry has appreciated fully that the munition industries have prior claims on available coal supplies, for use either directly or indirectly, and it has given all the support it could to appeals for voluntary rationing of domestic consumption. Its efforts in this direction have been unflagging. It remains difficult for us, however, to envisage an equitable scheme of rationing of gas. We discussed the problem at the end of last year in the light of the 24th Report of the Select Committee on National Expenditure. So far as coal, coke, and oil are concerned, economy can be assured by withholding the supply of these tangible products. With gas, the problem is very different. If industries have to be served, gas must be continuously on tap for industrial and domestic consumers alike, for, generally speaking, both are supplied through the same mains. It is impracticable to curtail supply by cutting-off the domestic consumer when he has had his allotted ration. In these circumstances the consumer is able to exceed his ration of gas before a practical remedy can be applied. The establishment of a basis for gas rationing presents numerous and formidable difficulties accentuated by the shifting of population; from the point of view of administration any scheme, it would seem, must inevitably be cumbersome and expensive if it is to be equitable. However, we are promised compulsory rationing without delay, and the Gas Industry will do all it can to implement the Government's demands.

The debate on coal production *vis-a-vis* consumption was, as we have said, hardly a sanguine one, but one point about it impressed us, and that was the acknowledgment freely expressed of the value of and the need for the products gained by the rational treatment of coal, which led to the pronouncement that the first charge on restricted supplies of coal must be for undertakings for which a particular type of coal is essential. Gas undertakings obviously fall into this priority class, and we hope that coals more suitable for their purpose will be allotted, for in this direction real fuel economy and fuel conservation undoubtedly lie. It is no fault of the Gas Industry if, because it is supplied with inferior and unsuitable coal, it produces inferior results. Stress was laid during the debate on the developments which have taken place in the replacement of imported petroleum products by coal tar oils; it was stated that measures are being taken to use tar in place of bitumen; reference was made to benzole and toluole production; and mention was made of the work on producer gas for motor transport—regarding which the Government intends to take a decision "as soon as possible." Judging from the number of years which have elapsed since the Government first put its hand seriously to this problem, it should be easy enough to take a decision. We hope that within a week or so the Government will feel itself in a position either definitely to encourage or equally definitely to discourage the use of producer gas for the purpose, instead of complacently beating about the bush. If the decision is one of encouragement, then the Gas Industry will be able to provide the necessary fuel provided it is supplied with the necessary coal.

The demand for the utmost production of gas, coke, and tar was never more pronounced in the national interests, and during the coming warmer months, when domestic requirements for gas normally decrease and will in the circumstances diminish by compulsion, far greater efforts than have yet been made should be put forward to supply increased quantities of suitable coal to gas undertakings so that we need not count on any "recurrence of luck." One thing is certain, as Dr. E. W. Smith pointed out at the Southern Association Meeting. The Gas Industry has wonderfully flexible processes at its command, and it will devote all its technical skill to producing the utmost from such materials as are available.

"REGULO"

"REGULO" has for many years been in the best and widest sense a household word. It was, of course, an extraordinarily happy trade name which Radiation Ltd. chose for the pioneer thermostat to be applied to gas oven heat control. It was well advertised, and this, coupled with its merits which soon came to be appreciated, quickly resulted in "Regulo" becoming automatically registered in the public mind. This must have been gratifying, but in a measure also embarrassing at times to the originators, for it was perhaps natural that with the passage of time the name should be used loosely by housewives to connote gas oven thermostats in general.

This thought occurred to us on reading an amusing article in *Punch* which had nothing whatever to do with gas cooking. In fact, the article was entitled "Americans in the Office" and was concerned with a conversation among the typists. One of them was talking about an American director who in peacetime was a pain in the neck to them, wanting to put up mottoes like *Work like Ellen B. Merry*. He and his efficiency experts were "about as much good as a sick headache. . . . The way they went on you'd think you'd only to set your typewriter at the Regulo mark and come back and take the work out when it was ready."

We have said that "Regulo" has for long been a household word; we now find it a term used glibly in office conversation. Whatever "headaches" the efficiency experts may have given the typists in the office mentioned in the *Punch* article, we feel sure that the typists themselves would be efficient through practice in the office and in their homes in linking-up mentally "Regulo" and Radiation Ltd.

Personal

The retirement early this year is announced of Mr. J. J. Lowe Engineer and General Manager of the Auckland Gas Company, New Zealand, after 25 years' service with the Company, ten years as Engineer and Manager, and 15 years as Engineer and General Manager. Mr. Rupert Worley, who for the past 21 years has been Borough Engineer at Hamilton, has been appointed Business Manager at Auckland, and Mr. G. H. Collins has been appointed Engineer.

Obituary

We regret to announce the death of Mr. John H. G. Horstmann, Director and Secretary of the Horstmann Gear Company. He had been ill since 1938, and during the past 12 months his condition considerably worsened. On March 17 he underwent a serious operation, from which he did not recover.

Mr. J. H. G. Horstmann, who was 45, joined the Somerset Light Infantry at the outbreak of the last War and soon after his enlistment was sent to Mesopotamia. He served during the whole of the War in the East. He returned to Bath in 1920 and immediately took up his duties with the Horstmann Gear Company, Limited. Some twelve years ago he succeeded his father as Secretary of the Company.

Mr. Horstmann was interested in the Society of British Gas Industries and was a prominent advocate of domestic and street lighting. In common with other members of his family he was the inventor of some widely used domestic gas appliances.

* * *

A Director of the Great Grimsby Gas Company, Mr. John Cash Store, died on March 11, at the age of 85.

The fact that goods made of raw materials in short supply owing to war conditions are advertised in the "Journal" should not be taken as an indication that they are necessarily available for export.

Letters to the Editor

Regional Planning Committee

DEAR SIR,—With reference to your Editorial of March 11, regarding post-war planning, you will, I feel sure, be interested to know that Yorkshire has appointed a Committee representing the Yorkshire Branches of the National Gas Council, British Commercial Gas Association, and the Yorkshire Commercial Section of Gas Engineers, to investigate and consider all matters concerned with post-war planning.

It was felt that a local Committee considering the aspects of this all-embracing and vital subject would be better qualified to transfer recommendations to the Central Committee, by a general study of the problem as affecting this area, than simply by discussing it at a general meeting called to meet the Convenor.

Several well attended meetings have already been held in Yorkshire, and considerable progress has been made.

48, James Street, Harrogate. March 21, 1942.

Yours faithfully, C. BATEMAN.

Rationing of Fuel

DEAR SIR,—"The worst of it is, you are at one end of a gas pipe and we are at the other, and you have no means of knowing what we are doing."

These words, spoken to the writer by the late Town Clerk of Maidstone, inevitably recur to one's mind in connexion with the proposed re-introduction of a rationing scheme for gas and electricity. Before any final decisions are taken and further burdens thrown on the staffs of gas undertakings, it is to be hoped that those who speak for the Industry will stress the idea underlying the Town Clerk's remark that we are not purveying our goods across a counter, and that, even under the most favourable circumstances, many weeks must elapse before it is possible to ascertain whether a consumer has exceeded his ration or not.

One of the principal objections to the Fuel and Lighting Order, 1939, was that the *premises* were rationed, and not the occupants. Anomalies were inherent in the scheme from the outset owing to redistribution of the population, whether due to evacuation of some areas and influx into others, or to other causes connected with the national effort. I think it may truly be said that those connected with the Gas Industry have done all they could to make a success of the National Fuel Economy Campaign, but two main factors have militated against its success. These are—

(1) The hard and prolonged winter.

(2) The shortage of domestic fuel.

To these I would add a third—*viz.*, the increased spending power of the working classes.

As regards (1) and (2), it must be obvious that to deny an adequate supply of gas to people in severe weather when coal is hard to come by might prove false economy, and I believe this has been pointed out in the columns of the "JOURNAL." Regarding the third, human nature being what it is, working-class folk are not likely to deny themselves that minimum standard of comfort to which they, perhaps more than others, are entitled in these trying days.

On the whole, therefore, it is difficult to view the prospects of any new scheme of rationing being more successful than those that have been tried already.

Yours faithfully

Maidstone Gas Company
March 20, 1942.

F. A. GULLAND,
Secretary and Accountant.

The Standing of Gas

DEAR SIR,—It is very disturbing to learn from your article under the above title in your issue of March 11 that the Director-General of Post-War Building has no reference to gas upon his programme—although similar industries are duly represented.

Why do we continue to "hide our light under a bushel" and always "peep out at the same small hole"? Is it not time that our Parliamentarians were made aware of the fact that the Gas Industry is the third largest capitalized concern in our country? Few of our representatives in Parliament realize that we keep 70,000 miners at work and that thousands of railway workers are employed dealing with our coal transport; that we supply a colossal number of cubic feet of gas each year through supply pipes up to 4 ft. diameter; that upwards of eight million gas cookers each day are in use to prepare our food, while gas fires and radiators have given us warmth and comfort throughout the severe winter; that we are indispensable in the production and supply of petrol and benzole, particularly now that overseas supplies are restricted; that in our treatment of coal there is no waste, for there is returned to us 12 cwt. of coke from each ton of coal carbonized, in addition to tar, pitch, sulphate of ammonia, creosote and valuable tar and fuel oils. In addition to which we must now obtain the bulk of our medical requirements at home, and these are largely produced from the redistillation of the by-products from coal.

Before it is too late we must assert our importance in order to safeguard our coal supply before restrictions are established, for these would react upon both large and small consumers. As you appear to be in touch with the "Powers-That-Be" I am hopeful that you will convey to them these points.

Yours, &c.,
March 19, 1942. "STANDARD BEARER."

[Standardization of Apparatus

DEAR SIR,—The remarks of Mr. A. H. Dyer, of Newport, Mon., under the above heading, as published in the "JOURNAL" of March 11, contain a number of important and interesting points.

It is, of course, recognized that many undertakings, large and small, have for some years past made standards of their own, particularly in the hire and limited hire types of cookers, and in this connexion a number have adopted the policy of putting these cookers out to consumers without thermostats. I think the question of using thermostats on every grade of cooker offered to the public needs at this stage some extra consideration.

Quite recently one of the largest gas undertakings in the Kingdom has stated that from a close canvassing of their district they found that by far the majority of consumers were not using the thermostats fitted to their cookers. This rather gives one the impression that large numbers of consumers have little concern about the uses of the thermostat, but accept it as it is included in the sale price or hire rate of the cooker offered to them.

While on the question of the thermostat, which, it must be admitted, has been and will continue to be a useful accessory to gas apparatus, a standard calibration for all types and makes is highly desirable. This, I think, is a subject which gas undertakings should take up themselves. It is generally agreed that numbers will take the place of letters which some makers have been using on their thermostats, but what requires closer attention is the temperature intervals between these numbers. It is well known that four or five years ago the G.L.C. Research Department gave a good deal of time and thought to this same subject as they were not satisfied that any curve of temperatures then existing in the various 'stats supplied to them by the makers was the ideal one. The result of their work was the production of the "Gastat," which is also made and sold as the "Spersom," over a million of which are in actual use. This is perhaps a good time to thrash out the question of standard calibration of thermostats, and, if this is effectively accomplished, such a standard will, without doubt, hold for a long time to come.

I note Mr. Dyer refers to the standard cookers brought out by the National Gas Council twenty years ago, which cookers I had close acquaintance with. It was unfortunate of course that these standard cookers came into being just before the enamelled cooker era. It was also unfortunate that the Committee which was responsible for their design and production was disbanded soon after their appearance and no one was left to continue to keep those black finish standards up-to-date.

Mr. Dyer's comments with regard to cooker flue spigots raise another point, although it is one which had considerable attention given to it in the 1922 cookers, which had variable flue openings regulated by the oven gas tap. Considering that the vast majority of gas cookers are fitted without flues, does this point call for standardized flue spigots?

Standardization of taps would certainly be a great boon to gas undertakings, but this would prove to be a difficult point upon which to obtain decision unless makers' complete hotplates were standardized as Mr. Dyer further suggests. With the hotplates standardized by makers, the valuable sales point to which Mr. Dyer refers in his earlier remarks would be lost to a very large extent as the general appearance of the cookers would then be so very much alike.

48, Grosvenor Gardens, S.W. 1. March 21, 1942.

Yours faithfully, H. F. POTTER.

In their Report for the year ended Dec. 31, 1941, the Directors of Radiation Ltd. recommend the payment of dividends at the same rate as last year—6% on the Preference Stock for the half year to Dec. 31, 1941, and 6% for the year on the Ordinary Stock, both less income-tax. The Accounts show that Radiation Ltd. is coming strongly through a difficult period, and, as compared with 1940, an increased profit can be recorded, while the carry-forward figure is also very satisfactory.

Continued difficulties which are being experienced in maintaining supplies of coal and other materials are referred to in the report of the Alliance and Dublin Consumers' Gas Company for the six months ended Dec. 31 last. Having regard to these difficulties, the Directors recommend the payment of a dividend on the Consolidated Ordinary Stock of the Company at the rate of 5% per annum, which will absorb £44,186 and leave £25,730 to be carried forward to the next account. For the corresponding half of 1940, the dividend was at the rate of 6% per annum, but the carry forward was much smaller, at £3,333. The total quantity of gas sold has increased from 6,893,281 therms in the last half of 1940 to 7,460,141 therms in the past six months. This moderate, but satisfactory, gain has been shared between the ordinary and prepayment consumers.

Southern Association of Gas Engineers and Managers

The Annual General Meeting of the Southern Association of Gas Engineers and Managers was held at Grosvenor House, Park Lane, London, on March 20, the President, Mr. G. le B. Diamond (Engineer and General Manager, Rochester, Chatham and Gillingham Gas Company) in the Chair.

The minutes of the last Annual General Meeting, as published in the "JOURNAL", were taken as read and confirmed. The President announced that, owing to circumstances which were unavoidable, it was impossible to submit the audited accounts, but he promised that they would be presented at the next meeting.

Election of Members

The President proposed, and Mr. D. C. Cross (Lea Bridge) seconded, the election of Mr. W. A. Howie (Maidstone) as the representative of the Association on the Council of The Institution of Gas Engineers.

On the proposition of the President, seconded by Mr. F. Blackburn (Devonport), the following were elected members of the Association:

Mr. H. G. Broadbridge, Andover.
Mr. W. J. N. Ware, Bromley-by-Bow.
Mr. F. W. R. Santler, Bude.
Mr. L. G. Mills, Sandwich.
Mr. L. F. McLeod, South Metropolitan.
Mr. A. B. Seton, South Metropolitan.
Mr. W. Verity, Newton Abbot.
Mr. H. A. Allan, Tiverton.
Mr. W. J. Burley, Okehampton.
Mr. R. F. Robinson, Ilfracombe.
Mr. T. Clemo, Portishead.
Mr. Carnel Teed, Sturminster Newton.
Mr. N. S. Smith, Bristol.
Mr. J. T. Haynes, Bournemouth.
Mr. E. A. Smith, Guildford.
Mr. O. R. S. Ingham, Gravesend.
Mr. J. W. Townsend, Sheppey.
Mr. S. H. Cox, Haywards Heath.

Presentation to Mr. Blackburn

The PRESIDENT, on behalf of the Association, presented a silver salver to Mr. F. Blackburn as a memento of his service as President of the Association for the years 1939, 1940, and 1941. Mr. Blackburn, he said, was the last of their peacetime Presidents, and the members had very happy memories of the visit they paid to him at Devonport when the war clouds were gathering. Since then he had suffered in calamity probably more than any of the members present, and they had every sympathy with him in the trials he had undergone.

Mr. BLACKBURN, in reply, thanked the members for the gift, and said that when the Committee asked him to carry on as President during the war they had an idea that his was a neutral area. Unfortunately the Secretary forgot to write to the people across the water to that effect.

Election of Vice-President

The PRESIDENT said he was delighted to propose from the Chair the election of Colonel F. J. Bywater, M.C., as Vice-President. They would be especially glad to welcome him as Vice-President because he represented the South Metropolitan Gas Company, a great undertaking with great traditions.

Mr. E. V. EVANS seconded, and the motion was carried, Colonel BYWATER briefly responding.

The President's Address

The PRESIDENT then delivered a short Presidential Address, which will be reported in a later issue.

Colonel H. C. SMITH (Tottenham) moved a vote of thanks for the Address, and, after a brief reply by the PRESIDENT, Dr. E. W. Smith gave an informal Address (to which reference is made on page 429).

Gasholder Brochure

We have received from Mr. Leonard Bott, the well known inspecting engineer for structures and gasholders, a copy of a new booklet which he has published on his subject. Incidentally this records a change of address, to Glenside, Holyhead Road, Wellington, Shropshire. Our readers will remember that a year or two ago Mr. Bott published a brochure giving most useful information about gasholders which in piping times of peace he was able to distribute free, and for which there was very considerable demand from all parts of the world. Owing to the very necessary paper control regulations of to-day and the provision they have to make to avoid circulation of any literature which is not actually wanted, Mr. Bott on this occasion has fixed a price of 6d. post free for his new work. We feel sure that those who found the previous publication so useful will consider the "nimble saxpence" extremely well spent in applying to Mr. Bott for a copy of his new publication.

The Spring Meeting of the North British Association of Gas Managers will take place in Greenock on Wednesday, April 8, when Mr. R. D. Keillor, President of the Association, will deliver his Presidential Address. Following the meeting the members will be entertained at Lunch by invitation of the Corporation of Greenock and in the afternoon will visit Inchgreen Gas Works.

B.C.G.A. Activities

1. A Service Folder was issued on Feb. 18 consisting of seven items, the principal one dealing with the fuel economy campaign and containing a number of suggestions for members including leaflets and posters; also a questionnaire which members are urged to complete and return as soon as possible.

2. The Studio is about to move from its old premises at Grosvenor Gardens Mews, with which many members were well acquainted, to smaller and more convenient ones nearer Gas Industry House. This does not mean any curtailment of service, but owing to the restrictions on materials a revised display scheme from the Studio is under consideration and will be submitted to members in due course.

3. At a meeting of the Eastern District Management Committee held in Cambridge on Feb. 26, a recommendation, following that of the Executive Committee at their last meeting, was adopted that all Undertakings in the district should be represented on the local Post-War Planning Bodies with the twofold object of collecting all information available on post-war planning, and secondly to keep the local bodies in close touch with all that the Gas Industry is doing with a view to improved service after the war.

4. B.C.G.A. is keeping in close touch with the British Gas Federation Post-War Planning Committee through the Convener, Mr. Stephen Lacey. They are also in collaboration with the Women's Gas Council to maintain contact with the many women's associations which are actively interested in post-war planning.

5. Mr. Hunter Rioch is to be the Association's representative at the week-end conference to be held at Cambridge from March 28 to 30, in connexion with Town and Country Planning.

6. The Annual Meeting of the members of the B.C.G.A. Midland District took place at Birmingham on Feb. 26.

7. A letter has been sent to all members of the General Committee asking them to display cards for the Lord Mayor's Distress Fund. These cards are available on request. The Fund, of course, covers all areas.

8. Through the Agent General for Queensland, four of the B.C.G.A. films have just been sent out to Australia. Queensland is the second State to be interested in these films, as a big selection has previously been sent to New South Wales. These B.C.G.A. films are becoming of international interest, and an American Film Library has just written asking for a full list to include in their index of industrial films.

Specifications for Non-Ferrous Metals

With the increasing numbers of specifications for non-ferrous metals, both in the general engineering series and in the aircraft series, there has been an increasing demand for some form of publication which would give in summarized form the details of the various specifications.

At the present time anyone requiring a specification for a particular material can only ascertain whether an existing specification will cover the type of material he has in mind by consulting a number of individual standards, and if these are not immediately available, as in most cases they are not, he is left to guess.

The need for a summary of the various specifications has, therefore, been stressed frequently. This need has now been met by the issue by the British Standards Institution of B.S. 1007, which not only summarizes the specifications in this country, but also gives details of the corresponding specifications in America.

The document covers the specifications in the general engineering series, the British Standard aircraft series, and the D.T.D. series; also the specifications of the American Societies of Testing Materials, the Society of Automotive Engineers, the Federal specifications, and those in the new series for aircraft purposes called the Aeronautical Material Specifications in America.

The summary includes 35 tables for aluminium and aluminium alloys, copper, copper alloys, nickel and nickel copper alloys, lead, tin, and zinc. It covers all forms of metal—*e.g.*, sheets, bars, rods, ingots, castings, wire, &c.

Copies of this B.S. 1007 may be obtained from the British Standards Institution, 28, Victoria Street, S.W. 1, price 10s. 6d. (11s. post free).

The Annual Meeting of the Midland Association of Gas Engineers and Managers will be held at King Edward House, New Street, Birmingham, on Thursday, April 2, when Dr. E. W. Smith, C.B.E. (Director-General of Gas Supply), will give an informal Address.

The Directors of the Gloucester Gas Light Company recommend the declaration of a dividend for the half-year ended Dec. 31, 1941, at the rate of 2¾%, less income-tax, making a total of 5½% less tax for the year.

A Cable has been received by the Colonial Gas Association Ltd., from their head office in Melbourne, stating that at a recent meeting of the Directors interim dividends were declared, for the half-year ended Dec. 31 last, at the rate of 4% (Australian Currency) on the Preference shares, and at 2½% on the Ordinary shares, both less income-tax.

QUO VADIS?

Dr. E. W. Smith, C.B.E., Director-General of Gas Supply, gave an informal talk to the Southern Association of Gas Engineers and Managers at their Annual Meeting at Grosvenor House, London, on March 20. It was obviously not an occasion for the usual type of report, but we are glad to be able to give some impressions of what was an extremely valuable interchange of thought.

THE Directorate of Gas Supply was established six months ago, and from the moment that Dr. Smith and his team (comprising Mr. J. F. Ronca, Mr. George Evetts, Mr. E. J. Fottrell, and Mr. P. Chantler) started work they agreed that they had got to see the war through first, that the problems of the Gas Industry had to be settled quickly, and that everything that the Industry wanted should be given to it as soon as possible. Consequently they have not yet given much time to post-war planning, but they have always had in mind that every decision made and every action taken must be such as not to interfere with the obvious direction in which the Industry is to go. The Industry is more than ripe for radical changes, not because of any loss of business or fear of competition, but because with such power and such possibilities of serving the community it seems a crime that opportunities should be neglected for lack of co-ordination and organization.

The First Positive Step

When the P.E.P. Report came out about five years ago it was not too well received at the time by the Gas Industry, but it was the result of 3½ years' hard study by a group which included men closely associated with the Industry, and it formed a definite basis of constructive thought for the future of the Industry. The next positive step forward came a year ago when Dr. Harold Hartley raised the question of reconstruction at a meeting of the Gas Research Board. It was no business of the Board, as such, but members decided to make themselves responsible for a move and asked Mr. E. V. Evans to prepare a memorandum on the problems of the Industry to-day. The memorandum was sent to about 20 members of the Industry who were selected for their independent thought and sympathy towards development. About half of them sent considered replies, and those ten or eleven people subsequently met at Nottingham and discussed their respective replies. Mr. Evans prepared a further memorandum, which proved to be the basis of the work of the British Gas Federations' Post-War Planning Committee.

Next came the 1941 meeting of The Institution of Gas Engineers, presided over by Mr. George Dixon, one of the men who had received the memorandum, at which there were a number of very important Papers on the future of the Industry. It was at that meeting that Dr. Smith uttered his now memorable warning (quoted in full in the announcement of his appointment as Director-General in the "JOURNAL" of Oct. 8, p. 53) that he could see no satisfactory future for the Industry if it continued the old order, but expressed confidence in the future if it was prepared to accept radical changes. Three months later it was announced that the Board of Trade was taking over all matters relating to fuel, and Dr. Smith was appointed Director-General of Gas Supply.

In the course of his talk, Dr. Smith took the opportunity of expressing appreciation of the generosity of his old Company in allowing him to go into the Board of Trade and become a Civil Servant, and to work in an honorary capacity so far as the Government is concerned. Such generosity has strengthened his position enormously, and has given him independence, which is a very great advantage.

Full Recognition at Last

In what was formerly the Gas Administration Department, the Gas Industry already had friends, who, prior to the establishment of the Directorate, had nothing but regret for the fact that they were not allowed to assist and direct the Industry. When the President of the Board of Trade sent for Dr. Smith, he agreed that gas had never had the treatment it should have had, and he wanted him to come in and see that it got its proper status. There is nothing but enthusiasm all through the Civil Service for this development, and if ever in the past the gas interests in the Board of Trade or the Gas Industry itself felt that it was not getting proper treatment and that it had not a sufficiently high standing, to-day it is getting all the recognition it can desire, and other Departments are only too glad to refer matters to the Directorate which previously they seemed anxious to handle themselves.

During the last six months it has been necessary for the Directorate to concentrate on the problems brought about by the war, and the whole team has spent most of its time and energy in that connexion. At the beginning it might have done what many others have done—create an elaborate organization and sundry new departments and so on. Rightly or wrongly from the beginning it was realized that the position might be only transitory, and therefore the right thing to do was to strengthen the Department that would be permanent, and back up and support the Civil Service. As it is, the Directorate works in all official matters through Mr. A. J. Cousin, the Assistant Secretary of the Gas and Electrical Section of the Board of Trade. Dr. Smith appreciates very much the way Mr. Cousin and his staff are supporting the Gas Directorate in every conceivable way. There has not been a single difficulty.

The other pleasing feature of the present position and outlook has been the creation within the Industry of the Post-War Planning Committee. The appointment of that Committee was the direct outcome of Mr. E. V. Evans's report, and in the personnel of that Committee Dr. Smith feels that the Industry has got extraordinarily good material, and it is very fortunate in having the leadership of Sir David Milne-Watson. The Committee will need the Industry's 100% loyalty—and that does not mean there is to be no criticism—but it must be recognized that it is the focus for the new developments of the future. There is no real differentiation between the Gas Directorate and the Industry, because they are pooling their resources. They are all one, with the same objective, and within a reasonable time such advances should be seen as will surprise those who may have looked forward with some misgivings as to the possibilities of the Industry.

No Red Tape

There is the closest association between the Post-War Planning Committee and the Gas Directorate, and there is no red tape. There are no formalities except on legal questions, outside which all the members of the team are at the Industry's service. They are its Service Department, the co-ordinating body in the absence of anything better in the Industry itself.

The future depends, if it is going to be a good one, on the personnel of the Industry having a very definite mind as to the direction in which it wants to go. Consequently it is essential that there should be very thorough discussion, not only in London but also in the "regions"—districts we used to call them—among the juniors, the seniors, the commercial side, the industrial side, the engineers, and the administrators. There must be a maximum of discussion in order that eventually there will be an accumulation of wisdom at Headquarters such as will enable the people there to say, "Our problems are as follows; we cannot solve them unless certain things are done; the things we want done, the powers we want to exercise, are so and so; will you give them to us?" And the Industry will find no difficulty once it has got down to it.

Dr. Smith does not want the Industry to look upon him as a person with a fairy wand which can produce reorganization for them by magic. He is one of themselves; he can help, but it is *their* Industry, and if they do not know what is the right thing to do he cannot impose anything on them, because it would not work if he did, if they were not ready for it. It is up to the Industry, working through its leaders, giving them all the criticism they like, but with a maximum of loyalty, to see the matter through.

In recent months visits have been paid to many of the industrial areas up and down the country, and it was remarkable how everyone fundamentally appreciated the wonderful job of work that the Industry has done in maintaining supplies. To-day the Industry in the public mind, and particularly in the industrial mind, stands higher than ever it did in its whole history.

Public Service Must Come First

As regards the future and the question of reconstruction, it is Dr. Smith's personal opinion that the progress of the Industry depends on all those who have anything whatever to do with it. It must be recognized that it is first and foremost a public utility, which exists solely as a public service, and consequently anything which is not conducive to that objective must be taboo. Manipulations that merely mean increased outputs, and beating the other man, conditions that lead to increased profits merely for the sake of increases, are secondary. The Industry is urged to begin to think what are the conditions which must hold as regards the relationships between undertakings, as distinct from the relationships between the Industry and the consumer. An industry such as gas cannot be efficiently run, even though every one of its units is such as efficiently run, if they continue to exist as individual units without some connexion and co-ordination between them. This applies to any big business. Looking at the Gas Industry, then, as one huge business, there must be a much closer co-ordination of undertakings. The war has made that essential in many respects. Whether there will be Gas Commissioners, or whether Gas Boards might be formed, or something of the order of the Port of London Authority, one cannot tell until those in the Industry who have got the interests of the local authorities and the interests of the companies at heart have got together and determined what is the most practicable means. But there are means, and it is up to the Industry not to be discouraged or to be impatient merely because there has not been a complete solution in a very short time. No one

must expect too much from even a hard working Post-War Planning Committee, however often it sits.

To assist in this study the Board of Trade is developing the statistical department to which reference was made in the "JOURNAL" a few weeks ago. The lack of information of a reliable kind in connexion with the Gas Industry and all its ramifications is a serious handicap. It is hoped that the new Committee will be of great use both to the P.W.P. Committee of the British Gas Federation and to the Board of Trade.

The Need to "Regionalize"

A further step that Dr. Smith thinks is inevitable is that the Gas Industry will have to "regionalize." We are getting used to regions, and in this connexion the Board of Trade appreciates very much the work of the regional Gas Industry advisers. They have become the philosophers and friends of the gas engineers, and their functions have expanded far beyond their original intentions. The Directorate has also appointed men in seven or eight regions, known as Liaison Officers, whose functions were described at some length in a recent issue of the "JOURNAL."

The chief problem before the Industry, then, is to decide in what direction it wants to go, and the nature of the overriding directing power that must be set up to implement the agreed policy. The Director-General will work through the national P.W.P. Committee, which should have the support of all sections of the Industry. At the same time Dr. Smith will be as accessible to everybody in the Industry as he was to the members of the Southern Association at the meeting in London. He can help the Industry to get what it requires so long as its object is to give service to the consumer.

At the conclusion of Dr. Smith's address, the members were invited to discuss any points which in their opinion required elucidation. The fact that there was only one oral contribution—from Mr. E. V. Evans, who observed that the problems before the P.W.P. Committee were inconceivably complicated, and there was no doubt that if it had not already made mistakes it would make some in future, but the biggest mistake it could make would be to produce ideas and recommendations that had not the backing of the majority of the Industry—was a clear indication of the unanimity of feeling in support of all that Dr. Smith had said. As Mr. S. E. Whitehead remarked, in expressing the thanks of the meeting, Dr. Smith had given the members more than they could digest within the compass of their Annual Meeting, but the address had been most inspiring and the whole meeting an extremely valuable one.

Standardization of Special and Alloy Steels

On the instructions of the Iron and Steel Control a Memorandum of the utmost importance to all users and producers of wrought and alloy steels has just been issued by the British Standards Institution (reference No. 970A).

In August last year B.S. 970 was issued. It included 58 steels in what is called the En. series, and it was stated that it was considered that this range would be adequate to cover all the essential needs of the general engineering industry. This work of co-ordinating the steel production of the country has now been taken a stage further, and has been given practical effect by a Direction which has been issued by the Iron and Steel Control to all steel producers stating that in future all wrought and special alloy steels supplied shall be made to a selected list of 44 of the 58 steels given in B.S. 970.

This decision, which represents a very important step in rationalization in the steel industry, has been taken in full consultation with all the services. The memorandum now issued explains the direction and sets out the steels actually available.

Any user, producer or contractor who has not so far received a copy of the memorandum which is being circulated to contractors by Government Departments is advised to communicate with the Secretary of The Institution of Gas Engineers, 1, Grosvenor Place, London, S.W. 1, from whom copies are obtainable, price 9d. each.

Fighting Gas-Works Fires

Gas-works and by-product plants are exposed to increased fire risks in these days, and it is appropriate that Minimax, Ltd., Feltham, Middlesex, should have issued two folders describing their wide range of CO_2 extinguishers. Carbon dioxide, which has long been known to possess ideal fire extinguishing properties, is stored as a liquid in steel cylinders and is discharged in the form of a dense white gas cloud. The pressure at which it is discharged renders it especially suitable for dealing with gas and inflammable liquid fires, and being a non-conductor of electricity it may safely be used for all electrical fires. One of the folders referred to deals with hand extinguishers ranging from a total weight of 14 lb. (2 lb. CO_2) up to 61 lb. (12 lb. CO_2), and the other gives details of hand truck appliances holding from 20 to 100 lb. of CO_2, and a trailer carrying twin 80 lb. cylinders and 35 ft. of high pressure hose.

Buses Running on Producer Gas

Re-appointed in November last to investigate the use of producer gas for road transport, and more particularly to estimate the quantities of suitable fuel which could be made available at present and to report on the measures required to increase the supplies if necessary, the Henley Committee is expected to issue its report within the next fortnight. Meanwhile the practicability of running buses on producer gas has been demonstrated by one of the largest road transport undertakings in the country, which has saved approximately 136,000 gall. of imported liquid fuel on an aggregate run of over a million miles. In the earlier experimental stages various types of cokes were tried out, but were not brought into general use, partly because the company felt they were not obtainable in sufficient quantities, and partly because the particular varieties used in the experiments were not entirely suitable; they were found to be disproportionately bulky, having regard to the required mileage per charge.

Two depots have for some time been operating exclusively on producer gas, and at the recent Annual Meeting of Thomas Tilling, Ltd., the parent company, Mr. John F. Heaton, Chairman and Managing Director, said these operations were not viewed merely as a wartime expedient. With an adequate supply of suitable fuel at a reasonable price, there was no reason why the operation of a proportion of the Company's services by producer gas should not prove to be a permanent feature.

All the buses at both selected depots maintain the same time schedules as were previously worked on petrol. The producer units are regularly serviced at the depots, and drivers and all concerned are co-operating happily. About 60 tons of fuel, at 85s. per ton, are used per month at these two depots and the route mileages range from 5 to 40 miles.

The earliest experiments, which date from some months before the war started, were carried out with a French unit primarily intended to use charcoal as fuel. Filter troubles were encountered when the unit was run on anthracite. A Government type trailer unit was then tested, but trouble was again experienced with the dry-type filter. The complete producer unit was redesigned in the light of the experience gained, and Mr. W. J. Morison, Chief Engineer of the Eastern National Company, evolved a suitable filter which broke away from the conventional type in that water was employed as the filtering medium. Its adoption, with the addition of arrangements for upper cylinder lubrication, reduced the cylinder wear for producer gas vehicles to a figure comparable with petrol-engined vehicles. Over an extended test period the cylinder bore wear did not exceed 0.001 in. per 4,000 miles of running. Efficient filtration and the more regular running achieved with the improved filters focused attention on other necessary improvements. Air leaks were eliminated, and steps were taken to overcome the trouble that arose from temperature differences and consequent uneven expansion at the upper portion of the junction of the firebox trunk and the hopper body.

The fuel used in all the producers now in service is "Progasite" anthracite, activated with sodium carbonate. The activation is carried out by the Company itself, and the solution comprises 2 lb. of soda to a pint of water, the dressing being at the rate of 1½ lb. of soda per cwt. of anthracite. The solution is distributed in a finely divided spray over a thin curtain of the fuel falling by gravity from a storage bin to the delivery chute, and the activated fuel is bagged in readiness for filling the producer hoppers.

Of the many fuels tested in experimental operation, only "Suncole" was found to give a performance equal to that of soda-activated anthracite. It was, however, so bulky that extra large hoppers would have been necessary to provide equivalent mileage. Time schedules and operational arrangements make it necessary for a vehicle to do 150 miles without refuelling, and fuel bulk is therefore an important factor. Petrol is used only for starting, and the control arrangements are such that it is impossible for the petrol to be used for any other purpose. The very limited quantity of petrol allowed to each bus suffices for all starts in the course of the day's operation.

Additional indoor staff has been employed for the regular servicing of the producer units, all of which are of the trailer type. An important advantage of the trailer producer is that it can be cleaned and refuelled away from the vehicle running shed, and another advantage is that, with stand-by units, vehicles can be maintained in service while producers are under repair. Consideration has been given to the merits of built-in producers, but so far the trailer has been found to be preferable, from an emergency conversion point, and in the event of accidental damage to a unit on the road a relief unit can be rapidly towed to a stranded vehicle by a private car. There were a few "teething" troubles in connexion with reversing and manipulating vehicles with trailers attached, but the drivers quickly acquired the necessary technique, and no difficulties are now experienced either in the course of journeys or at the terminal turning points.

The fuel cost, with anthracite at 85s. per ton, now works out at a figure lower than for diesel oil and considerably lower than for petrol. Taking into account certain additional expenses incurred in operating the vehicles, such as refuelling and attention to the fuel hopper and filter, the total cost of running is rather higher than by diesel oil, but still lower than by petrol, and the Company is hopeful of still further improvements in this direction.

TOWN GAS AND KINEMATIC VISCOSITY*

By ARTHUR COE

(*Continued from p. 393*)

If, then, air entrainment is effected solely by diffusion, the mass of air entrained will vary with kinematic viscosity of the gas.

If the mass of air entrained varies with the kv, a change in the gas rate, with kv constant, will not result in a change in the air-gas ratio. That is, with a given burner the air-gas ratio will be the same at all rates of flow, for with kv constant the mass of gas flowing will be proportional to the gas rate.

The experimental results obtained by J. G. Clark, fig. 3, confirm these deductions. He found "the auto-aerating power of the gas (with this burner) to be nearly proportional to the gas rate, thereby tending to a constant percentage of aeration of the burner head mixture for all gas rates within the capacity of the burner . . . also . . . the density of the mixtures was practically the same for all three curves. That is, the mass was nearly proportional to the gas rate."

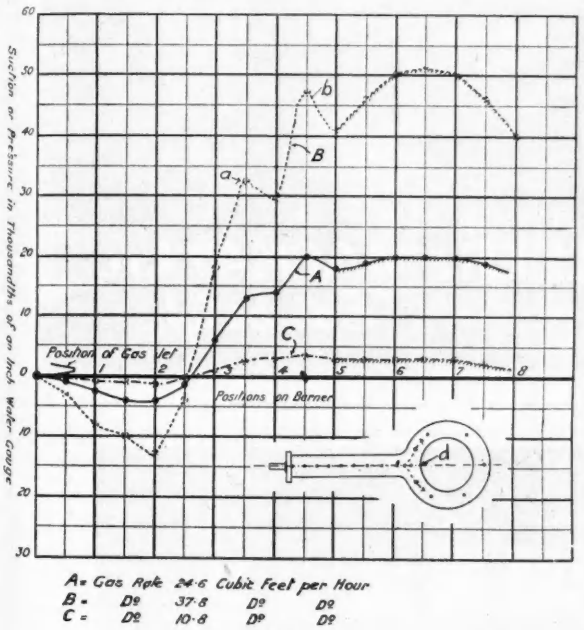


FIG. 3.

The almost exact coincidence of the three curves at their point of juncture with the atmospheric line is a remarkable confirmation of the soundness of this line of thought, for if each unit mass of gas has the same criterion of diffusion, the time taken for it to "entrain" its complement of air will be the same, provided the air-supply is not restricted. We know also that the process of diffusion is almost instantaneous when there is a pressure difference between the gases to be mixed, so that each increase in the mass rate of flow, with kv constant, will be accompanied by a proportionate increase in the corresponding pressure conditions, as was the case in the experiments under view.

It follows from this that there will be a critical distance between the injector orifice and the throat at which a given air-gas ratio will be maintained constant at all rates of flow with kv constant.

The effectiveness of the injector tube has been found to depend upon the distance of the throat from the orifice and upon the ratio of the area of the throat to the area of the burner ports, as well as upon the design of the injector itself. The distance of the orifice from the throat has been found to be very important, but the most effective distance for any given burner can be determined finally only by experiment; but, when the distance which gives the maximum injector effect is determined, it has been found to hold good for any pressure at the orifice, and for any gas rate.

It should be clear also that if the mass of air entrained in a given burner depends upon the kinematic viscosity of the gas, there will be a definite limit to the mass of air which can be entrained, and that no increase in pressure at the orifice will effect this, except in so far as the change in the density of the gas (with increase in pressure) effects a corresponding change in the kv, or induces turbulent flow which may result in the trapping of pockets of air in the stream. This is also in agreement with experimental fact, for there is a critical pressure at a burner orifice above which aeration remains for all practical purposes constant, and for which there has been previously no satisfactory explanation. (See the experiments quoted p. 787, vol. ii, of the *Science and Practice of Gas Supply*.)

We have seen that kinematic viscosity is a criterion of diffusion, and that mixing occurs by diffusion when two gases are brought together, until the mixture is uniform in composition, that is, until the rate of diffusion and the rate of interchange of the momentum between the molecules in unit time is the same for each unit area of any imaginary plane in the gas. When this diffusion-state is reached the kinematic viscosity of each gas in the mixture is the same, and the pressure will be the same, for pressure may be defined as momentum which is transferred in unit time through unit area of any imaginary plane in a gas.

It follows from this that the pressure at the throat will be constant *for a given burner* so long as the kv of the gas remains constant if the correct distance is observed between the injector orifice and the throat. The experiments of J. G. Clark, previously quoted, clearly establish the fact that this pressure point actually occurs.

In further experiments with the same burner, the gas rate was kept constant at 24.6 cu.ft. per hour, and the area of the primary air port was varied. The results are shown in fig. 4 (held over till next week). Commenting upon these, J. G. Clark wrote: "Notice that by creating high vacua when the primary air port was reduced, the gas jet tried—though in vain—to entrain sufficient air. The coincidence of the curves at the atmospheric line also disappears . . . because although the energy of the gas jet remained the same, each curve represents a different percentage aeration of the mixture in the burner. The mixtures varied in volume and density—that is, the mass was different in each case."

There is, therefore, a second factor which may limit the mass of air entrained. This operates below the limit fixed by the kv. This is the resistance to the flow of air into the mixing chamber. Hence, the primary air inlet should be of such an area that the gas is able to entrain the full complement of air at all gas rates and maintain the intial pressure of the flow system constant with changes in the rate of flow (kv constant).

In this view an air shutter is simply a means for restricting access of air to the diffusing cone of gas. The limit to diffusion in a given burner, with kv constant, is thus fixed by critical burner dimensions.

Summarizing

(1) With a given burner, the air-gas ratio will remain constant if the kinematic viscosity of the gas is constant, and the area of the primary air inlet is adequate—that is, the air-gas ratio will remain unaffected by changes in pressure at the injector orifice.

(2) The mixing tube of an atmospheric gas burner should have the form of a Venturi, as this maintains the conditions necessary to the maintenance of the same air-gas ratio at all the rates of flow, provided the kv of the gas remains constant.

(3) The air-gas ratio in a given burner with kv constant will not be appreciably affected by the size of the injector orifice. This follows from the fact that the effect of increasing the size of the orifice is solely to increase the area of the tip of the cone of diffusing gas.

(4) With such a burner the initial pressure of the flow system within an atmospheric gas burner will remain constant so long as the kinematic viscosity remains the same.

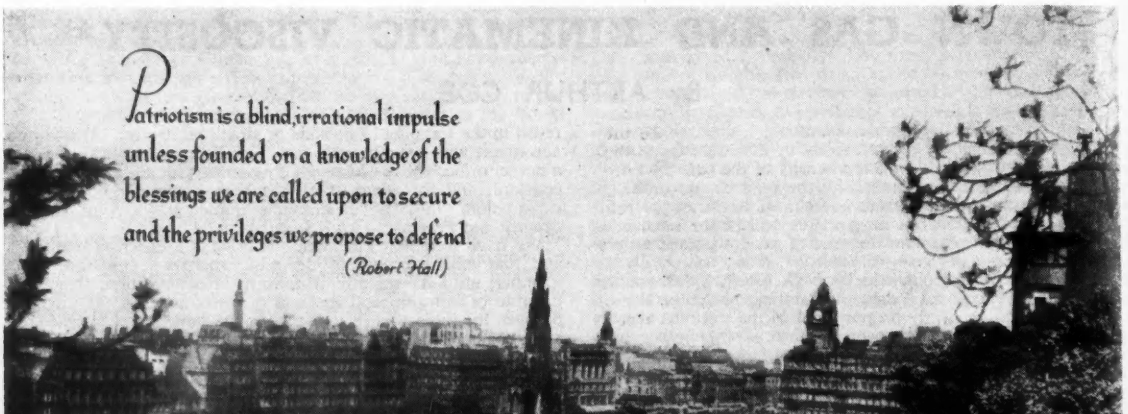
It follows from (4) that the initial pressure of the flow system in a given atmospheric gas burner which conforms to these requirements will remain constant so long as the kv of the gas remains constant. Stability in the performance of such burners will then depend upon the maintenance of the pressure drop in the system. This brings us to a consideration of the terminal pressure of the system.

The terminal pressure is that at the outer cone, and this is always exactly equivalent to the pressure of the atmosphere. If, then, the kv of the gas is maintained constant with a burner which maintains the air-gas ratio constant at all rates of flow, the initial pressure will be constant, and since the terminal pressure is also constant, the stability of the flame will be secured.

It is generally agreed that the inner cone in a bunsen flame represents a stationary explosion, and that its position conforms to the conditions that the rate at which ignition is propagated downwards shall equal the rate at which the air-gas mixture flows upwards. This follows from the fact that if a combustible mixture of gases at rest in a tube is ignited, the flame will flow through the mixture.

In a given burner the temperature in the inner cone is constant for a given combustible mixture. It follows from this that during the process of combustion each layer at the inner cone must give up precisely the same amount of heat to the layer of the mixture which follows it as it receives from the preceding layer. Also that the

* Author's abstract of a Paper to the Scottish Junior Gas Association (Eastern District).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unless founded on a knowledge of the
blessings we are called upon to secure
and the privileges we propose to defend.
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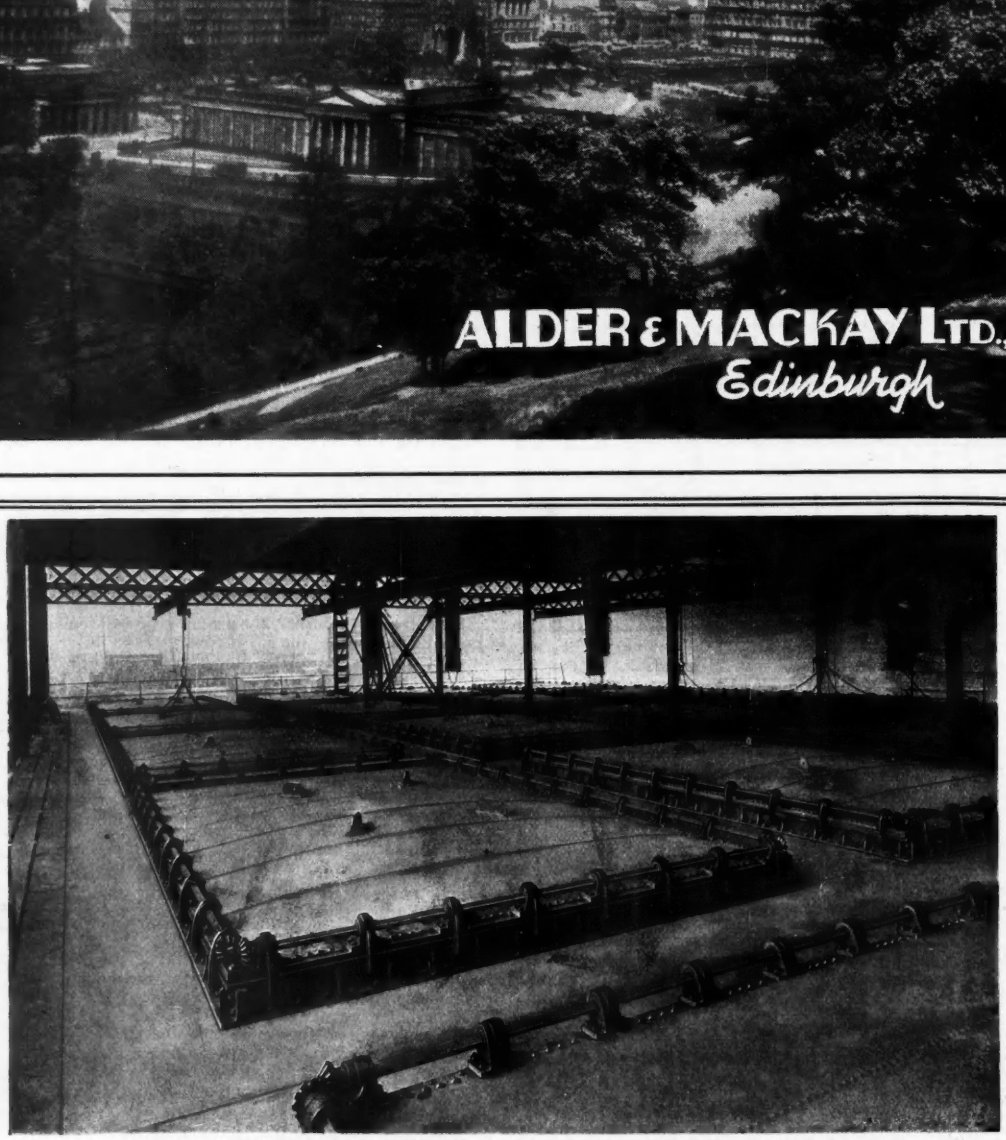

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quantity of heat transferred from layer to layer must be equivalent to the mass rate of flow of the mixture reaching the inner cone.

The reactions which occur in the inner cone depend primarily upon the concentration of the reacting molecules—*i.e.*, upon the mass rate of flow. The mass rate of flow, if other factors remain the same, is governed by the kinematic viscosity of the gas.

When the molecules reach the inner cone, they have to receive heat from the preceding burning layer equivalent to the amount received by it, at a rate equivalent to the mass rate of flow, and since the distances between the molecules are relatively large compared to the size of the molecules themselves, the molecules have also to make contact with one another before a reaction can occur.

We know that the rate at which this contact is achieved is governed by the coefficient of diffusion of the mixture, and that kinematic viscosity is a criterion of diffusion and a measure of the rate of transfer of momentum. Also that when the temperature of a gas is increased, the speed or velocity of its molecules is proportionately increased, and since the momentum of a molecule is its mass multiplied by its velocity, kv is also a criterion of the rate at which heat is conducted through the reacting mass.

The conduction of heat in a gas is simply the diffusion of the energy of the molecules by their moving about in the medium and carrying their energy with them till they encounter other molecules, when the energy is redistributed. The relation of the conductivity k, measured thermometrically, to the viscosity ν, measured kinematically, is—

$$k = \frac{5}{3\gamma}\nu.$$

γ = the ratio of specific heats.

It appears, therefore, that diffusion, kinematic viscosity, and conductivity in gases are related to each other in a very simple way, being the rate of equalization of three properties of the medium—the proportion of its ingredients, its velocity, and its temperature. The equalization is effected by the same agency in each case—namely, the agitation of the molecules. These properties of gases are sometimes referred to collectively as "transport phenomena."

The fundamental movements of molecules may thus be expressed in terms of a rate of diffusion, of a rate of interchange of momentum, or as a rate of conduction of heat.

The practical significance of kinematic viscosity is that since it is a measure of the rate of interchange of momentum between molecules, it is also a measure of the rate at which encounters are effected between the molecules of reacting gases. In other words, kinematic viscosity (mass-velocity) appears to be the measure of *active mass*, for a reaction cannot proceed at a greater rate than the rate of interchange of momentum, because the rate at which the heat of reaction is conducted to or from the reaction centres is also proportionate to the kinematic viscosity. Kinematic viscosity is not therefore to be regarded simply as a single physical property of a gas, but rather as a criterion of molecular activity or active mass.

Thus when the kinematic viscosity of a gas changes, the air-gas ratio and all the other factors which influence the equilibrium state within the inner and outer cones also change. The point to note here is that a change in the composition of the gas is accompanied by a change in the density and also a change in viscosity—that is by a change in kinematic viscosity. This changes the air-gas ratio, the initial pressure of the flow system, and the stability of the inner cone. The terminal pressure at the outer cone is always that of the atmosphere.

At the inner cone we have the kinematic viscosity of the air-gas mixture at room temperature governing the mass rate of flow into it, and the kinematic viscosity of the mixture of gases and of the products of the reactions at a relatively high temperature, governing the activation of the reacting masses, and the mass rate of flow out from it.

Now the coefficient of diffusion of a gas may be defined as "the ratio of the total mass per unit area which flows across any small section, to the rate of decrease of the density per unit distance in a direction perpendicular to that section." In other words, as a gas diffuses outwards, the rate of diffusion or of interchange of momentum falls in proportion to the increase in the area through which diffusion is occurring.

We know also that the superficial area of the surface of the inner cone varies with the flame-speed. Hence the superficial area of the surface of the inner cone must be such that rate of diffusion per unit area is equivalent to that of the gases reaching the flame front in streamlines, and therefore with a rate of diffusion proportional to the cross-sectional area of the burner head or approximately so.

It follows from the definition of the coefficient of diffusion that the rate of diffusion from the inner cone will vary inversely as the superficial area of the cone surface. That is, if the cone surface is reduced by half the rate of diffusion (or flame-speed) will be doubled. The converse must therefore be true—namely, that if the flame-speed be doubled the superficial area of the inner cone will be reduced by half before equilibrium is effected.

This is the fundamental fact underlying Gouy's concept for the calculation of flame-speeds, which may be stated as:

$$\frac{\text{The rate of flow of the air-gas mixture}}{\text{The area of the conical shell.}}$$

It follows from these facts that the inner cone takes up a position such that the mass rate of flow outwards from it is precisely the same as the mass rate of flow into it. And since the density of a gas which is free to expand cannot increase with a rise in temperature, the terminal pressure of the flow system and the stability of the flame are not affected by the position the inner cone takes up.

The point here is that no matter how complicated or involved the reactions are, the physical changes which accompany them in the inner cone can only result in a balancing of the mass rate of flow to the inner cone against the mass rate of flow of the mixture of gases and products away from it. The masses involved are the same, and since it is the mass rate of flow to the inner cone which is balanced by the expanding (or diffusing) gases effecting an exact and appropriate change in the area of the inner cone, what happens in the inner cone cannot affect the mass rate of flow through the system, or the terminal pressure.

The terminal pressure is constant and is governed by the pressure of the atmosphere. The area of the outer cone and consequently the size of the flame is also governed by the mass of the gases reaching it. This leaves only variations in the initial pressure of the system to account for any instability which may occur in bunsen flames.

Before proceeding to consider the precise practical significance of this hypothesis there are several points which can be advantageously considered relative to the shape of the inner cone.

In a burner tube the mixture is flowing under the pressure drop from the throat to the burner mouth, where the pressure is that of the atmosphere. When the whole of the available pressure energy of the mixture is converted into energy of flow (kinetic energy) the "gas" pressure is *nil*—that is, the absolute pressure of the gas will be approximately the same as that of the atmosphere in the vicinity of the point of discharge. At this point, however, although the gas pressure is *nil*, and the available pressure energy is also *nil*, the gas stream has momentum, and available kinetic energy. Hence, when the mixture leaves the end of the tube and meets with the resistance of the atmosphere it loses momentum and kinetic energy, but gains pressure and pressure energy.

The momentum of a gas stream varies as v^2, and the distribution of velocity across the stream is not uniform, but the pressure or resistance of the atmosphere is uniform, so that in streamline flow a balancing of masses or pressures will occur upon each streamline. This will occur upon each streamline when the resistance to flow has absorbed the momentum possessed by the stream along that line. The balancing of pressures in accordance with the distribution of velocities across the stream is therefore responsible for the shape of the inner cone. It is also clear that the distribution of velocities characteristic of the state of flow must hold up to the surface of the inner cone. The shape of the outer cone being to some extent modified by upward convection currents of air around the flame.

The removal of the constraining influence of the tube is responsible for the overhang of the flame. That is, the stream spreads on leaving the tube precisely as any other fluid flowing from a pipe to an outer point of zero pressure. This broadens the base of the cone and creates a velocity drop about the axis which results in the rounding of the tip. That is, there is a redistribution of the velocities when the stream leaves the tube, and the inner and outer cone shapes are the result.

The distance between the base of the cone and the burner tube is that required to absorb the momentum at the edge of the stream—that is, it is not constant as has been assumed for so long.

We thus have the hypotheses (1) that the shape of the inner cone is determined by the distribution of velocities across the stream of gases reaching it; (2) that the height and superficial area of the inner cone is dependent upon the rise in temperature of the mass of gases reaching the flame front; (3) that the pressure corresponding to even the highest speed of flame is in the neighbourhood of one atmosphere. (This is in agreement with experimental fact.)

(*To be continued*)

Ireland's Coal Difficulties were referred to by Mr. E. T. Mahony, the Chairman, at the Annual Meeting of the Cork Gas Consumers' Company, when he thanked those who, at considerable discomfort to themselves, had voluntarily cut down their gas consumption. The coal situation, he said, had been very serious since September of last year. Of the coal allotted, two-thirds went to Dublin and one-sixth to Cork, the remaining one-sixth being divided between the smaller undertakings. This allotment covered only a small percentage of the Company's requirements, and they were dependent for the balance upon grades of coal unsuitable for making either gas or coke. Often the good coal arrived a week or ten days after the specified time, leaving them with practically nothing to mix with the inferior grades. Such a crisis occurred in the middle of December, when it seemed for a time as though they would have to close-down for a few days; but at the last moment some hundreds of tons of coal were released from the Government stock, and the danger was averted. Although they had had to curtail the supply of gas, they had not had to close-down the works for a single day. Appealing again for full co-operation on the part of consumers, he said that, while some had shown an example of good citizenship, many, especially in the hilly districts, had used all the gas they could get, and so reduced the volume available in the flat part of the city. Steps had been taken to prevent a recurrence of this. A dividend was declared at the rate of 6% per annum for the past half-year.

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Gas Products Prices

The London Market Mar. 23.

There is very little movement in the prices of Coal Tar Products, as many of the usual markets are no longer available and pitch/creosote mixture as a fuel oil has taken their place.

Pitch is still a nominal market, but for such quantities as are being sold the price ranges between about 45s. and 50s. per ton. Creosote is about 5d. to 6d. per gallon. With regard to refined tar the price for next season has not yet been definitely fixed and it is expected that this will come under a Direction to be issued by the Coal Tar Controller. Pure toluole remains 2s. 5d. per gallon under the Ministry of Supply Toluene No. 2 Order. Pure benzole is about 1s. 10d., 95/160 solvent naphtha is 2s. 5d. to 2s. 9d. and 90/160 pyridine remains about 13s. 6d. per gallon. All the above prices are *ex* Makers' Works. Naphthalene prices are unchanged and are in accordance with the Control of Tar Order 1941. The Order refers to maximum prices, and the figure for refined crystal naphthalene in 2-cwt. bags and 4-ton lots is £23 per ton delivered.

The Provinces Mar. 23.

The average prices of gas-works products during the week were: Pitch and Crude Tar,* Toluole, naked, North, 1s. 10d. (controlled by the Control of Toluene No. 2 Order, July 5, which fixes the maximum price at which this material may be sold). Coal tar, crude naphtha, in bulk, North, 11d. to 1s. Solvent naphtha, naked, North, 1s. 9d. to 1s. 10d. Heavy naphtha, North, 1s. 9d. to 1s. 10d. Creosote, *ex* works, in bulk, North, liquid and salty, 4½d. to 4¾d.; Scotland, 4¼d. to 4¾d.; low gravity, 4¼d. to 4¾d. Fuel Grade, 4d. to 4¼d. Carbolic acid, 60's, 3s. 7½d. to 3s. 9d. Naphthalene, £15 to £20. Salts, drained, £6 to £6 10s.; whizzed 72°, £7 15s.; 78°, £9 5s. Anthracene prices fixed by Controller. Heavy oil: Unfiltered anthracene oil (min. gr. 1,080), 6d. to 6½d.; filtered heavy oil (min. gr. 1,080), 6½d. to 7d.; heavy anthracene oil gr. less than 1,080, 5¾d. to 6d.

*In regard to pitch and crude tar prices we would ask readers to refer to the editorial note on p. 396 of the "JOURNAL" for Sept. 10, 1941.

Tar Products in Scotland Mar. 21.

Steady throughput is maintained. Refined tar 5d. to 5½d. home and 5d. to 5¼d. per gallon export. Creosote oil: Specification oil, 6d. to 6½d.; low gravity, 7d. to 7½d.; neutral oil, 6½d. to 6¾d. per gallon; all *ex* Works in bulk. Cresylic acid is well looked after. Values are strong. Pale 99/100%, 5s. to 5s. 6d.; Pale 97/99%, 4s. 6d. to 5s.; Dark 97/99%, 4s. 3d. to 4s. 6d. per gallon; all *ex* Works in buyers' packages. Crude naphtha: 6¼d. to 7d. Solvent naphtha: 90/160 grade 2s. to 2s. 3d. and 90/190 Heavy Naphtha 1s. 9d. to 2s. per gallon. Pyridines: 90/160 grade 13s., and 90/140 grade 15s. per gallon.

Gas Stocks and Shares

There was more stock available in the Gas Market last week and the number of recorded transactions was heavier than for some time past. This was especially the case among the fixed-interest stocks and it will be seen that a number improved in value a few points. Alliance and Dublin quickly recovered the *ex div.* marking down of a week ago and, with the stock changing hands at round about 94½, finally closed 6 points higher. The heavy falls in the two Malta and Mediterranean preference stocks in the Supplementary List were due to £40 return of capital on each stock on Thursday last.

The following quotations were altered during the week:

PROVINCIAL EXCHANGES

Newcastle 4 p.c. Pref.	85½—86½	+½

OFFICIAL LIST

Alliance & Dublin Ord.	91—96	+6
British Ord. (*x.d.*)	71—76	Mar. 16
Commercial 3 p.c. Deb.	58—63	+1
Ditto 5 p.c. Deb.	92—97	+2
Gas Light Units	12/9—13/9	—/3d.
Ditto 4 p.c. Pref.	67—72	—1
Ditto 5 p.c. Red. Deb.	105—109	+1
Imperial Continental	50—55	—2
Mid-Southern Utility "C"	73—78	+3
Ditto 4 p.c. Pref.	77—82	+2
South Metropolitan 6 p.c. Pref. ...	76—81	+1
Ditto 3 p.c. Deb.	75—80	+3
South Suburban 5 p.c. Deb.	102—107	+1
United Kingdom Gas Corporation 3½ p.c. Red. Deb. (*x.d.*)	85—90	Mar. 16

SUPPLEMENTARY LIST

Malta and Mediterranean 7 p.c. 1st Pref.	20—30	—30
Ditto 7½ p.c. 2nd Pref.	20—30	—20

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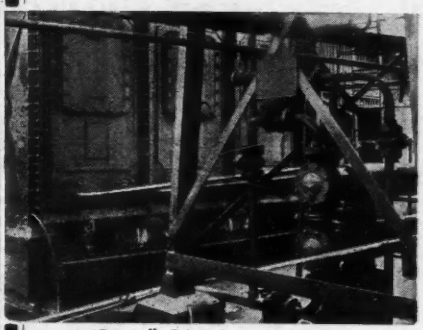

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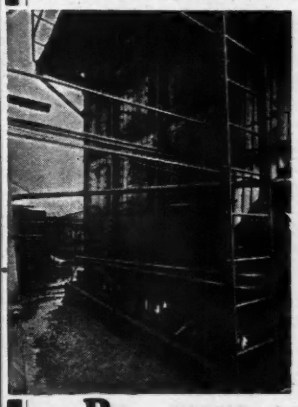

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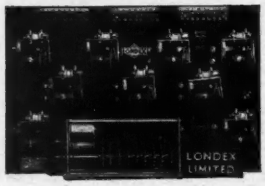

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